

# Introducing undergraduate research to enhance student learning at university

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# Outline

- ❁ Why engage undergraduates in research and inquiry?
- ❁ My ALTC National Teaching Fellowship
- ❁ Practical implications
- ❁ How to move this undergraduate research agenda forward



# Some like it cold

Surviving change  
in the Arctic



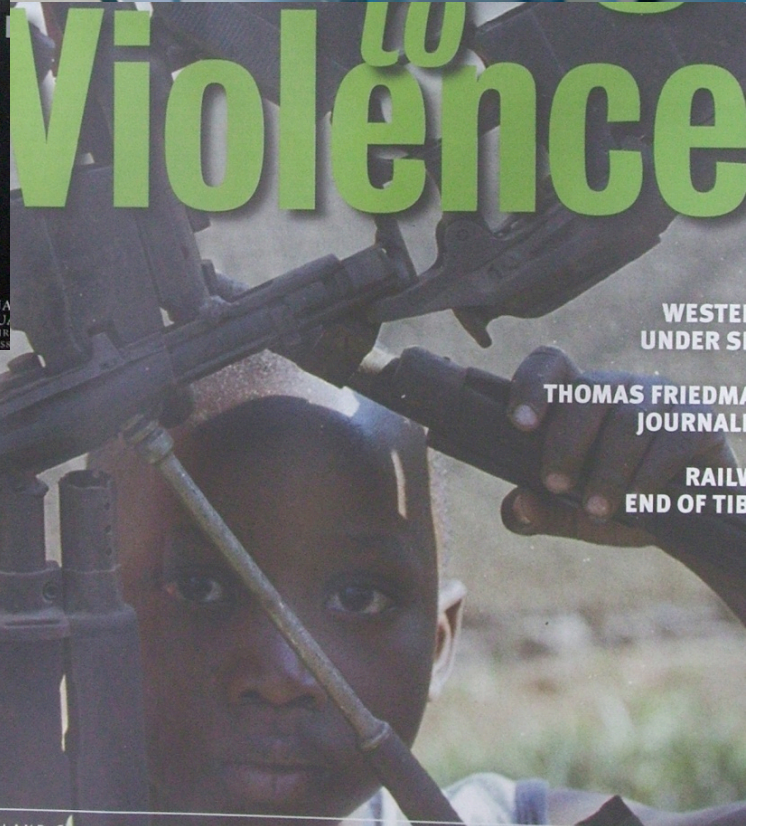
# Fear

The  
sugar  
trap



# Drowning in plastic

Living in a toxic world



# Violence

WESTERN  
UNDER SIEGE  
THOMAS FRIEDMAN  
JOURNALIST  
RAILWAY  
END OF THE

NI 415  
SEPTEMBER  
UK £125  
IRELAND €5.00  
AUSTRALIA \$8  
NEW ZEALAND  
CANADA & US

JAN  
FEBRU  
UK £3.25 + IR  
AUSTRALIA \$5





Ben Gulak: Uno cycle



Rafael Smith: The Über Shelter



- PLACE SHELTER IN DESIRED LOCATION



- OPEN FROM ENCLOSED POSITION TO BASIC STRUCTURE



- SET FLOOR, ATTACH JACK STANDS AND LEVEL THE STRUCTURE



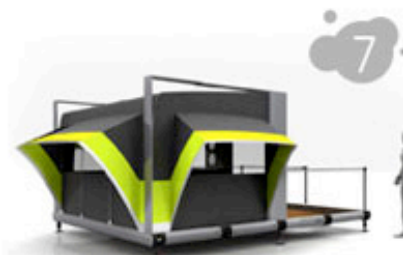
- SECURE I-BEAM AND SHELTER FLOOR INTO LOCKED POSITION



- ATTACH FABRIC SUPPORT RODS AND MODULAR REINFORCEMENT



- ATTACH INNER FABRIC LINING. THIS INCLUDES AN ALREADY INTERWOVEN MOSQUITO NET

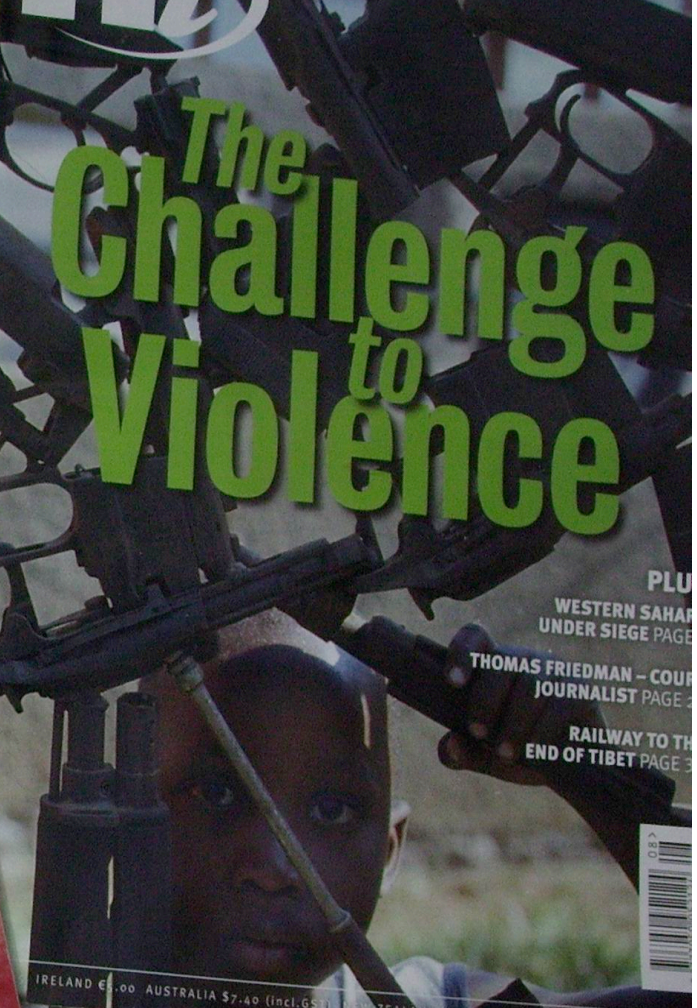
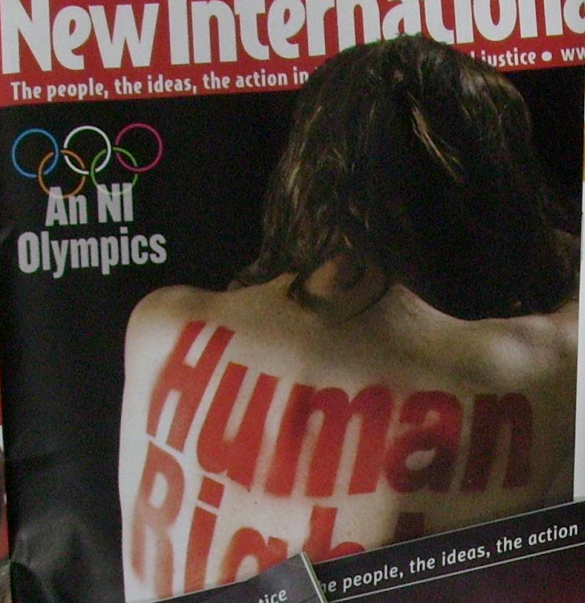


- ATTACH OUTER FLY LAYER OF FABRIC. THIS LAYER HELPS SHIELD FROM THE SUN AND PROTECT FROM THE ELEMENTS



- SECURE TOP FLOORING TO BOTTOM STRUCTURE AND REPEAT THE PROCESS









# National documents

- ❁ "Public funding should be directed only to those institutions that: encourage both students and staff to engage in critical enquiry...." (Bradley Review Report page 7)
- ❁ "Self-fulfilment, personal development and the pursuit of knowledge as an end in itself; the provision of skills of critical analysis and independent thought to support full participation in a civil society; the preparation of leaders for diverse, global environments; and support for a highly productive and professional labour force should be key features of Australian higher education." (Transforming Australia's Higher Education System)



# Integrating research and teaching to enhance student engagement

- ❁ Positive impact on retention and satisfaction
- ❁ Students learn what research is and how to do it
- ❁ They develop a sense of professional identity
- ❁ Clarifies career goals
- ❁ Increases in self confidence
- ❁ Develops of advanced technical skills, problem solving, creative thinking and communication skills e. g. giving presentations
- ❁ Develops independent work habits
- ❁ Enhances teamwork and collaboration
- ❁ Ability to deal with ambiguity and obstacles

# What students gain

“In sum, the literature converges on a broad set of benefits as arising from engagement in authentic research. Notably congruent are: gains in confidence and in establishing collegial working relationships with faculty and peers, increases in students’ intellectual and practical understanding of how science research is done; students’ greater ability to work and think independently from faculty; and the role of UR both in helping students to assess the fit of research as a career and to clarify career and graduate school plans. ... these results underscore UR experience as offering a constellation of gains that collectively reflect students’ personal, intellectual and professional growth.” (Hunter, Laursen, Melton, Seymour, Thiry forthcoming)



# What the AUSSE measures...

- ❁ Six engagement-focused scales
  - ~ Academic Challenge
  - ~ Active Learning
  - ~ Student and Staff Interactions
  - ~ Enriching Educational Experiences
  - ~ Supportive Learning Environment
  - ~ Work Integrated Learning
- ❁ Six outcomes-focused measures
  - ~ Higher-order Thinking
  - ~ General Learning Outcomes
  - ~ General Development Outcomes
  - ~ Average Overall Grade
  - ~ Retention Intention
  - ~ Overall Satisfaction

# High impact educational practices

(Kuh, 2008)

1. First year seminars and experiences
2. Common intellectual experiences
3. Learning communities
4. Writing-intensive courses
5. Collaborative assignments and projects
6. Undergraduate research
7. Diversity/global learning
8. Service learning, community-based learning
9. Internships
10. Capstone courses and projects



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# Aim of my Fellowship

To enhance student engagement in learning through supporting the development in Australia of undergraduate research and inquiry



# How to identify national needs

 Study tours

 National documents

 Undergraduate research

 Key personnel

# Intended outcomes

- ✿ Identify national needs
- ✿ Enhance debates concerning engagement of undergraduate students in research and inquiry
- ✿ Establish a set of readily available resources and protocols to bridge gaps between current and future practice
- ✿ Disseminate these through a [website](#) and discussions
- ✿ Provide the foundation for the establishment of a national centre for the integration of research, teaching and learning

# Definition of undergraduate research and inquiry

An inquiry or investigation conducted by an undergraduate student that makes an original intellectual or creative contribution to the discipline.

(Beckman & Hensel, 2007)



# Definition of undergraduate research and inquiry

[An] inquiry or investigation or a research-based activity conducted by an undergraduate student that makes an original intellectual or creative contribution to the discipline and/or to understanding.  
(following Beckman & Hensel, 2007)

# Tensions in implementing undergraduate research and inquiry

Student, process  
centered



Outcome, product  
centered

# Reinvention a Journal of Undergraduate Research

## Reinvention: a Journal of Undergraduate Research

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*Reinvention: a Journal of Undergraduate Research* has now reached its first birthday. In our first year we have published our launch issue and our first volume. We have grown from accepting papers from the Reinvention Centre's two host institutions, to accepting papers from around the world and the response we have had from undergraduate students and academic staff alike has been better than we could have predicted. Our website has received over 40,000 hits in this first year alone with 6,500 individual visitors to the site and we hope to build on this success in our second year.

Click here for Current Issue



## nexus journal of undergraduate science engineering and technology

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Volume 1 2004

Volume 2 2005

Volume 3 2006

Submission details

Nexus: journal of undergraduate science, engineering and technology of integrating and promoting the teaching/research nexus within the University of Tasmania.

The journal highlights linkages between high-level learning and research publication. It also provides a showcase for the research undertaken by students from the disciplines of science, engineering, and technology.

It is published annually.

Volume 3 is currently being laid out for printing and will be published in the preparation of Volume 4 of Nexus: journal of undergraduate science, engineering and technology is underway.

### Currently

We are calling for academic staff, able to nominate students who are willing to provide a mentoring role. The work needs to be:

- of a high quality;
- written in semester 2 2006, semester 1 2007;
- able to be **formatted** as either a research paper or a review article.

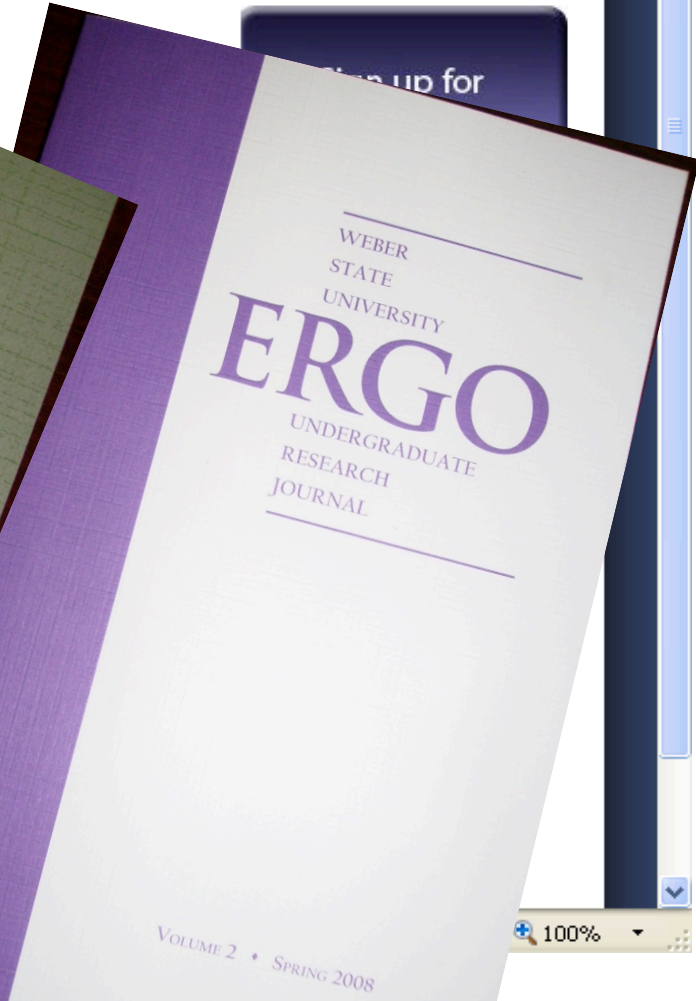
Mentors are usually Unit Coordinator, but can be any staff member. The mentor is to provide guidance to the student on the research paper submission. It is not envisioned that the student will be required to present their work.

Initially, we need Unit Coordinators to simply nominate students who are interested in providing a mentoring role.

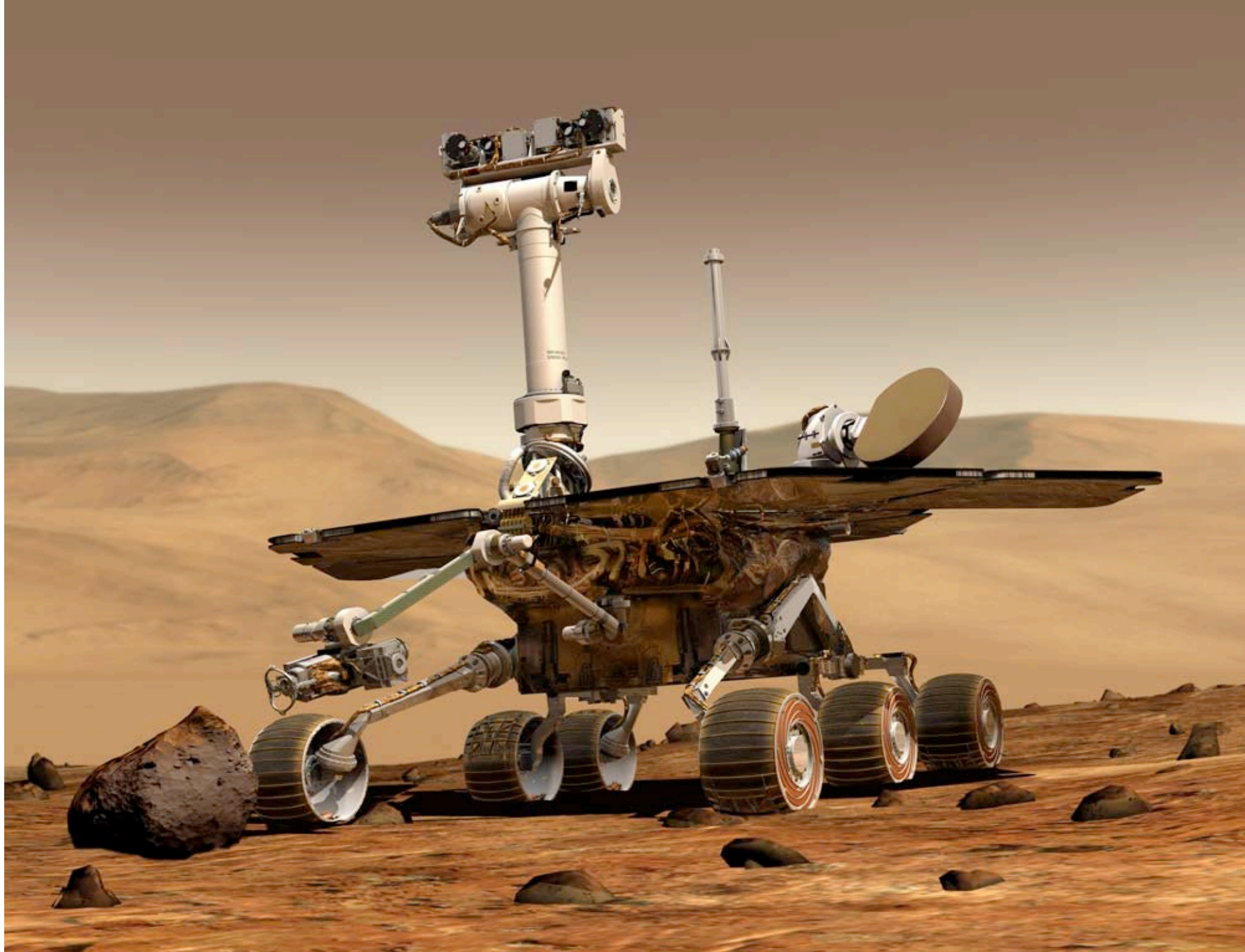
### Timetable

The following dates punctuate the timeline for Volume 4's release:

- June 8th (or earlier) — unit coordinators to advise the Editorial Committee







# Tensions in implementing undergraduate research and inquiry

Student, process  
centered



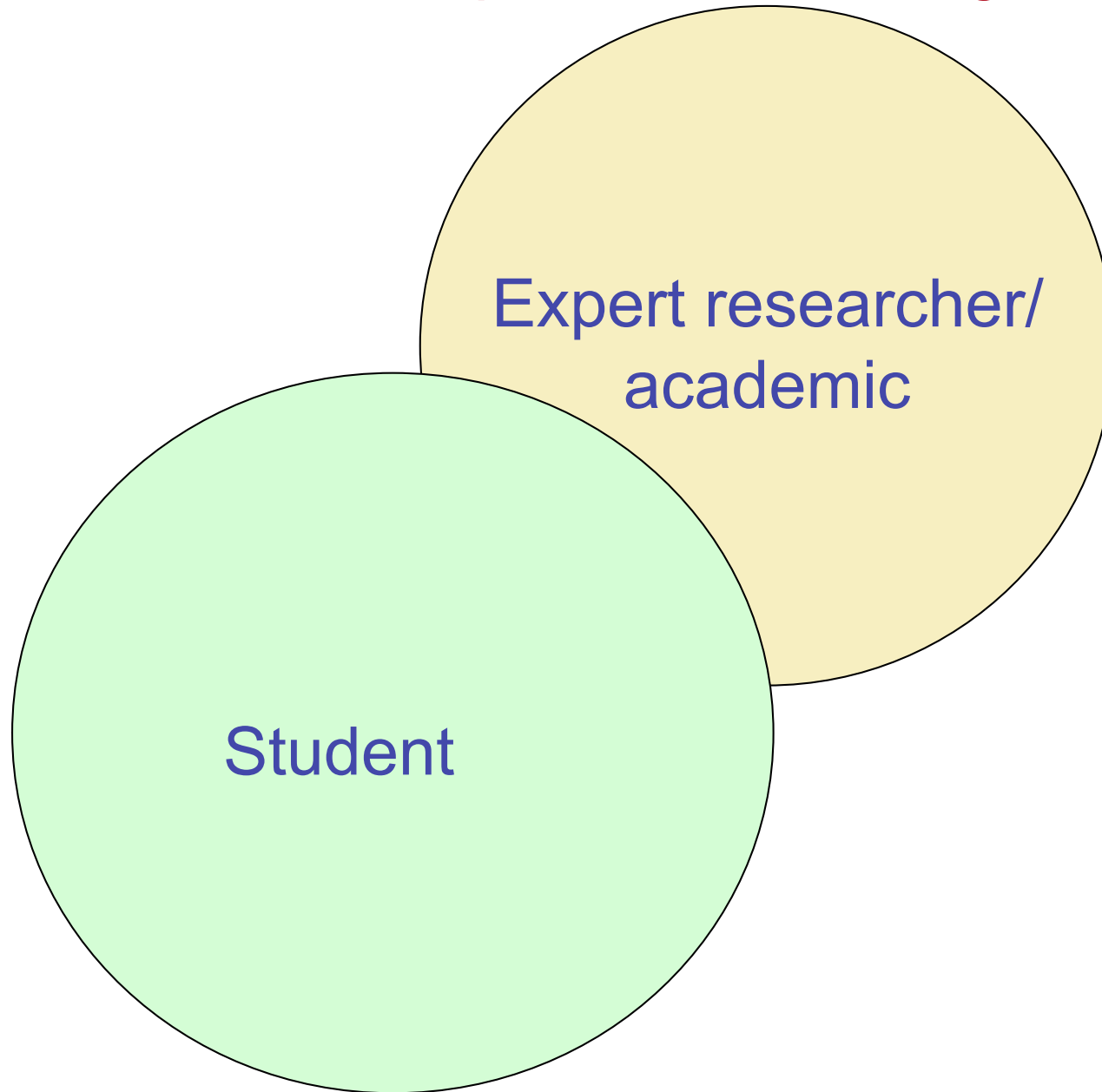
Outcome, product  
centered

Student initiated



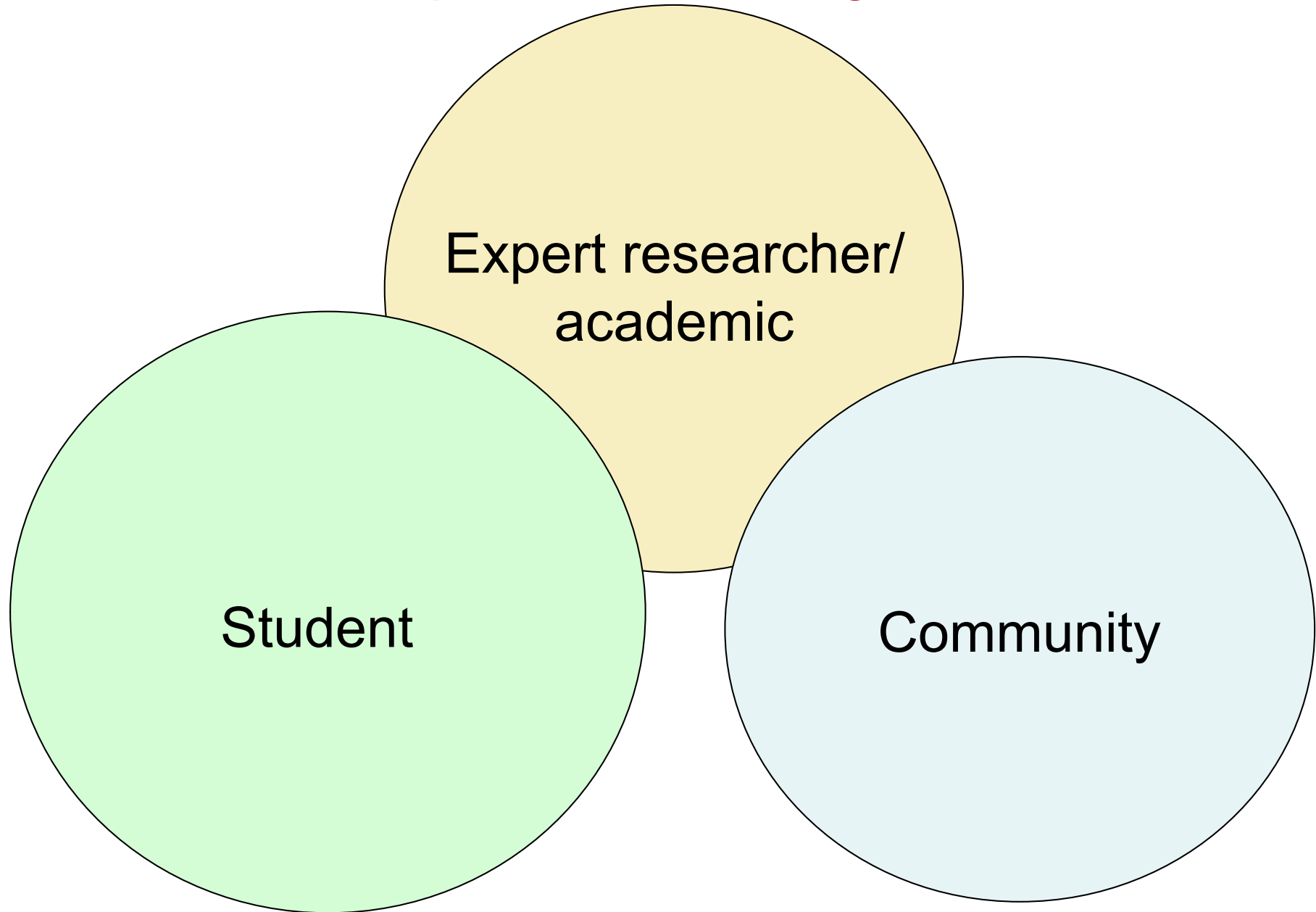
Faculty initiated

# Who defines the question in undergraduate research?





# Who defines the question in undergraduate research?



# Tensions in implementing undergraduate research and inquiry

Student, process  
centered



Outcome, product  
centered

Student initiated



Faculty initiated

Honors students



All students

[Link](#)

# Tensions in implementing undergraduate research and inquiry

Student, process  
centered



Outcome, product  
centered

Student initiated



Faculty initiated

Honors students



All students

Curriculum based



Co-curricular

# Research in the curriculum can be carried out







1. Assignments and tutorials within specific subjects
2. Whole courses or programs, for example across year levels
3. At whole of degree level e.g. PBL, IBL



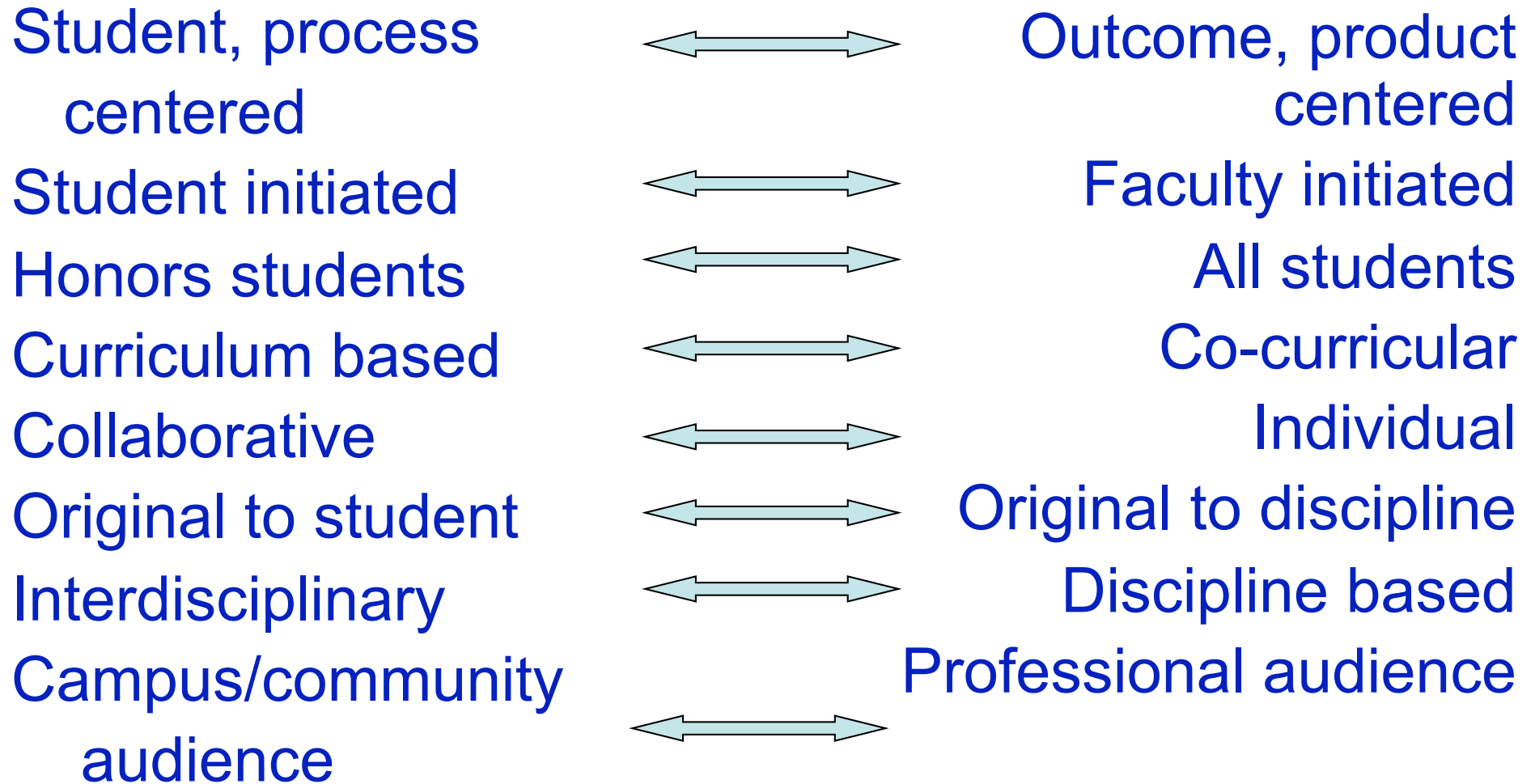
# What needs to change?

- ❁ Course organisation structures: from individuals to course teams
- ❁ Module flexibility
- ❁ Vertical integration
- ❁ Ideas about research and who is capable of doing it
- ❁ Teaching spaces

# Tensions in implementing undergraduate research and inquiry

Student, process centered		Outcome, product centered
Student initiated		Faculty initiated
Honors students		All students
Curriculum based		Co-curricular
Collaborative		Individual
Original to student		Original to discipline

# Tensions in implementing undergraduate research and inquiry





**SOURO8**  
SOUTHERN CALIFORNIA CONFERENCE ON UNDERGRADUATE RESEARCH  
November 22, 2008  
California State Polytechnic University  
Pomona

22ND ANNUAL  
CALIFORNIA STATE UNIVERSITY  
STUDENT RESEARCH COMPETITION  
CALIFORNIA STATE UNIVERSITY, EAST BAY  
MAY 2 - 3, 2008  
**SRS**  
STUDENT RESEARCH SYMPOSIUM

2009 STUDENT  
RESEARCH  
SYMPOSIUM  
Celebrating the achievements  
of SDSU student research,  
scholarship and creative activity



Weber State University  
Sixth Annual Undergraduate Research  
Symposium & Celebration  
2008

California State University  
Student Research Competition  
23<sup>RD</sup> ANNUAL  
UNIVERSITY OF CALIFORNIA, SANTA BARBARA  
**UCSB**  
2009  
Undergraduate  
Research  
Colloquium

fifth annual undergraduate research  
Symposium & celebration  
Abstracts



THE FIRST ANNUAL  
STUDENT  
RESEARCH  
SYMPOSIUM  
Celebrating the achievements of  
San Diego State University students  
in research, scholarship & creative  
activity  
February 29 & March 1, 2008

University students  
scholarship & creative activity

February 29 & March 1, 2008



Weber State University  
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2008



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# Concluding key issues

- ❁ Importance of undergraduate research as a beginning preparation for research careers
- ❁ “The path I am setting out...raises the expectations we have of our young people and their parents and of our great institutions. It asks them to be bolder and more ambitious in what can and should be achieved” (Hon Julia Gillard MP 4th March 2009)



# References used in this presentation

- ❁ Picture taken by Angela Brew of various covers of the magazine “New internationalist.”  
<http://www.newint.org/>
- ❁ **Picture of Uno cycle by Ben Gulak**  
<http://www.nytimes.com/2009/01/04/education/edlife/ideas-Uno-t.html?ref=edlife> New York Times article: An Easy Ride Around the Crowd of Old Polluters
- ❁ **Uber shelter by Raphael Smith:**  
<http://www.nytimes.com/2009/01/04/education/edlife/ideas-ubershelter-t.html?ref=edlife>
- ❁ Question mark picture: unknown internet source
- ❁ Bradley, D., Noonan, P., Nugent, H., & Scales, W. (2008). Review of Higher Education Final Report. Canberra, ACT: Commonwealth of Australia.
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- ❁ ACER (2009). Australasian survey of student engagement. Retrieved 23<sup>rd</sup> November from: <http://www.acer.edu.au/ausse/>
- ❁ Kuh, G. D. (2008). *High-Impact Educational Practices: What They Are, Who Has Access to Them, and Why They Matter*. Washington, DC: Association of American Colleges and Universities.
- ❁ Beckman, M., & Hensel, N. (no date). Defining Undergraduate research. Carnegie Foundation for the Advancement of Teaching and Learning, Leadership Project on Undergraduate Research and the Scholarship of Teaching and Learning.
- ❁ Hunter, A-B., Laursen, S.L., Melton, E., Seymour, E., & Thiry, H.(forthcoming 2010). *Undergraduate Research in the Sciences: Engaging students in real science*. New York Jossey-Bass.
- ❁ Brew, A. (2006). *Research and Teaching: Beyond the Divide*. London PalgraveMacmillan.
- ❁ Undergraduate research journals including: Reinvention: the journal of undergraduate research, University of Warwick, UK, (<http://www2.warwick.ac.uk/fac/soc/sociology/rsw/undergrad/cetl/ejournal/>) Nexus: journal of undergraduate science, engineering and technology (<http://www.utas.edu.au/scieng/nexus/>) and Ergo, Weber State University, USA.
- ❁ **Picture of Mars Rover:** From Jet Propulsion Laboratory, California Institute of Technology:  
[mars.jpl.nasa.gov/.../20031104a.html](http://mars.jpl.nasa.gov/.../20031104a.html)
- ❁ Picture of booklets from various undergraduate conferences and colloquia taken by Angela Brew